National Institute of Environmental Health Sciences

Climate change: Links to global expansion of harmful cyanobacteria

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Abstract:

Cyanobacteria are the Earth's oldest (approximately 3.5 bya) oxygen evolving organisms, and they have had major impacts on shaping our modern-day biosphere. Conversely, biospheric environmental perturbations, including nutrient enrichment and climatic changes (e.g. global warming, hydrologic changes, increased frequencies and intensities of tropical cyclones, more intense and persistent droughts), strongly affect cyanobacterial growth and bloom potentials in freshwater and marine ecosystems. We examined human and climatic controls on harmful (toxic, hypoxia-generating, food web disrupting) bloom-forming cyanobacteria (CyanoHABs) along the freshwater to marine continuum. These changes may act synergistically to promote cyanobacterial dominance and persistence. This synergy is a formidable challenge to water quality, water supply and fisheries managers, because bloom potentials and controls may be altered in response to contemporaneous changes in thermal and hydrologic regimes. In inland waters, hydrologic modifications, including enhanced vertical mixing and, if water supplies permit, increased flushing (reducing residence time) will likely be needed in systems where nutrient input reductions are neither feasible nor possible. Successful control of CyanoHABs by grazers is unlikely except in specific cases. Overall, stricter nutrient management will likely be the most feasible and practical approach to long-term CyanoHAB control in a warmer, stormier and more extreme world.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality, Food/Water Security

Extreme Weather Event: Drought

Food/Water Quality: Biotoxin/Algal Bloom

Food/Water Security: Fisheries

Geographic Feature:

resource focuses on specific type of geography

Freshwater, Ocean/Coastal

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Workers

Resource Type:

format or standard characteristic of resource

Review

Timescale:

time period studied

Time Scale Unspecified